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Posttraumatic Stress Disorder and Depression Among U.S. Military Health Care Professionals Deployed in Support of Operations in Iraq and Afghanistan

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Limited prospective studies exist that evaluate the mental health status of military health care professionals who have deployed. This study used prospective data from the Millennium Cohort Study with longitudinal analysis techniques to examine whether health care professionals deployed in support of the operations in Iraq and Afghanistan were more likely to screen positive for new-onset posttraumatic stress disorder (PTSD) or depression after deployment than individuals from other occupations. Of 65,108 subjects included, 9,371 (14.4%) reported working as health care professionals. The rates of new positive screens for PTSD or depression were similar for those in health care occupations (4.7% and 4.3%) compared with those in other occupations (4.6% and 3.9%) for the first and second follow-up, respectively. Among military personnel deployed with combat experience, health care professionals did not have increased odds for new-onset PTSD or depression over time. Among deployed health care professionals, combat experience significantly increased the odds: adjusted odds ratio = 2.01; 95% confidence interval [1.06, 3.83] for new-onset PTSD or depression. These results suggest that combat experience, not features specific to being a health care professional, was the key exposure explaining the development of these outcomes.

Mental disorders occur at increased frequencies among U.S. military personnel returning from the operations in Iraq and Afghanistan (Hoge, Auchterlonie, & Milliken, 2006; Seal, Bertenthal, Miner, Sen, & Marmar, 2007; T. C. Smith, Ryan et al., 2008). The link between posttraumatic stress disorder (PTSD) and exposure to trauma among health care workers has been documented in civilian and military populations (Carson et al., 2000; Fullerton, Ursano, & Wang, 2004; Kolkow, Spira, Morse, & Grieger, 2007). Most postdeployment research, however, has focused on war fighters, with little investigation into the mental health of health care professionals deployed to combat regions despite their potential exposure to trauma (Carson et al., 2000; T. C. Smith, I. G. Jacobson et al., 2007). Two studies that examined PTSD among health care professionals deployed in support of the operations in Iraq and Afghanistan found that individuals reporting exposure to dead or wounded bodies were not at increased odds for PTSD (Jones et al., 2008; Kolkow et al., 2007), but the first study did find a strong association between PTSD among health care professionals and reports of exposure to direct combat, or feelings of being in danger (Kolkow et al., 2007). Both of these studies were conducted using a retrospective design, however, highlighting the need for prospective assessment including baseline data to investigate PTSD and depression. Additionally, PTSD and depression are often examined separately despite their co-occurrence, raising the possibility that one may serve as a marker for the other if examined separately, and showing a need to consider both (Grieger et al., 2006; Palgi, Ben-Ezra, Langer, & Essar, 2009).

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This study addressed gaps in previous research by using longitudinal data from the Millennium Cohort Study to investigate the association between newly reported positive screens for PTSD or depression among health care professionals following deployment in support of the operations in Iraq and Afghanistan.

Method

Participants and Procedure

Participants were drawn from the Millennium Cohort Study, a large, prospective cohort aimed at evaluating the effects of military service on short- and long-term health outcomes. Participants are surveyed every 3 years after initial enrollment. The study's first panel includes 77,047 participants enrolled from 2001–2003 (36% of those able to be contacted). A second panel was enrolled from 2004–2006 and consisted of 31,110 participants (25% of those able to be contacted). Among those with valid addresses, reasons for nonparticipation included not receiving the invitation, being deceased, determined to be ineligible, or explicit refusal to participate. Of Panel 1 participants, 71% responded to the 2004 and 2007 follow-up surveys, and 55% of Panel 2 participants responded to the 2007 follow-up survey. A more detailed description of the methods of this study can be found elsewhere (Ryan et al., 2007). The present study included members of the first and second panels who completed a baseline and at least one follow-up questionnaire ($n = 80{,}524$). Of the 80,524 participants with at least one follow-up assessment, 4,285 were in the Marine Corps and ineligible because Navy personnel assume all health care positions for this service branch, 3,197 were missing demographic or covariate data, 3,849 were missing PTSD or depression outcome data, and 4,085 screened positive for either PTSD or depression at baseline, leaving 65,108 individuals for descriptive analysis.

Measures

We defined PTSD *or* depression as occurring among individuals who had not previously screened positive for either of these conditions at their baseline assessment. These disorders were examined together because of the small numbers within population strata when restricting analyses to combat deployers. The PTSD Checklist-Civilian Version (PCL-C) is a 17-item screening tool for PTSD (Blanchard, Jones-Alexander, Buckley, & Forneris, 1996) where participants self-report responses rating the severity of each intrusion, avoidance, and hyperarousal symptom during the past 30 days using a 5-point Likert scale (from 1 = *not at all* to 5 = *extremely*). The civilian version of this instrument was used in this military population because by design most subjects in the Millennium Cohort Study will separate from service before the end of the study follow-up. Participants screened positive for PTSD if they reported a moderate or greater level of at least one intrusion symptom, three avoidance symptoms, and two hyperarousal symptoms, aligning with the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM-IV-TR*; American Psychiatric Association, 2000) criteria. The Patient Health Questionnaire (PHQ) screening tool was used to assess depression, measured by nine items from the PHQ (PHQ-9), which correspond to the depression diagnosis from the *DSM-IV-TR* (Kroenke, Spitzer, & Williams, 2001). Participants screened positive for depression if they met the following criteria: (1) endorsed having a depressed mood or anhedonia, and (2) responded ''more than half the days'' or ''nearly every day'' to at least five of the nine items, where thoughts of being better off dead or hurting oneself was counted, if present at all. Because new-onset PTSD or depression was the outcome of interest, individuals who screened positive for either PTSD or depression at baseline were removed from analysis.

The main exposure was occupation as a military health care professional, identified using self-reported occupation from the questionnaire. Enlisted personnel were able to self-report the following health care occupations: medical care, ancillary medical support, biomedical sciences or allied health, dental care, and medical administration or logistics. Officers were able to self-report the following health care occupations: physician, nurse, dentist, veterinarian, biomedical sciences or allied health, health service administration, or psychologist. If a participant did not provide an occupation code on a given questionnaire, then duty occupation codes from electronic personnel files closest to the month and year that the questionnaire was submitted were used. If Department of Defense (DoD) electronic occupation codes were used, codes were translated and classified using the DoD Occupational Conversion Index manual. A dichotomous variable was created to compare all health care professionals with individuals in all other occupations. To further examine the incidence of the study outcomes among specific health care occupations, subcategories were created as follows: (a) physicians, nurses, and psychologists; (b) medical care and support (including veterinarians); (c) biomedical, allied health professional, and dentists; and (d) medical administration and health services. Groupings were based on likely occupational exposures and practical duties in the deployed environment.

Deployment was ascertained from electronic military data documenting in and out of theater dates for personnel deployed in support of the operations in Iraq and Afghanistan. Combat-related experiences in relation to deployment were based on self-report of personal exposure to at least one of the following during a 3-year period coinciding with deployment: witnessing death, physical abuse/torture, dead bodies, maimed soldiers or civilians, or prisoners of war or refugees. Individuals categorized as deployed with combat experience completed a deployment and reported combat experience during the period preceding the outcome assessment. Individuals classified as deployed without combat experience completed a deployment during the period preceding the outcome assessment, but did not report combat experience during that time. Individuals who submitted baseline and/or follow-up questionnaires during a

deployment were also categorized as deployed with or without combat experience, depending on their responses to the combat items. Nondeployed individuals were not deployed during the time period preceding the outcome assessment. For deployed personnel, total number of deployments and cumulative deployment length were evaluated. Deployment experience prior to baseline captured deployments prior to enrollment in support of the following: the recent operations in Iraq and Afghanistan, the 1991 Gulf War, or the operations in Southwest Asia, Bosnia, or Kosovo between 1998 and 2000.

Demographic and military covariate data were obtained from DoD electronic personnel files. Variables were selected a priori based on past work with the cohort showing an association between each variable and PTSD or depression (T. C. Smith, Ryan et al., 2008; T. C. Smith et al., 2009; Wells et al., 2010), and included sex, birth year, race/ethnicity, education, service branch, service component, and military pay grade, which were all held constant at baseline, and marital status was allowed to vary over time.

Self-reported behavioral covariate data were assessed at each time point and allowed to vary over time. Variables also previously shown to be associated with the outcome (Boyko et al., 2010; Seelig et al., 2010; T. C. Smith, Ryan et al., 2008; T. C. Smith, Wingard et al., 2008; Wells et al., 2010) included smoking status, prior trauma/assault (forced sexual relations or sexual assault, or suffered a violent assault), alcohol-related problems as defined by the PHQ (Spitzer, Kroenke, & Williams, 1999) ($\geq$1 alcohol-related problem indicated a positive screen), having a prior positive screen for either panic or anxiety disorder assessed using the PHQ, and trouble sleeping (trouble falling asleep or staying asleep).

Data Analysis

Univariate analyses were employed to investigate unadjusted associations of the outcome with occupation status, and demographic and behavioral characteristics. Because those subjects in this study followed for 6 years had multiple assessments of covariates and outcome, we used generalized estimating equations (Zeger, Liang, & Albert, 1988) for correlated data to examine adjusted associations. Analyses accounted for both fixed and time-varying covariates. Subjects were followed until they either developed the outcome or the follow-up period ended. An initial analysis was completed using a variance inflation factor of four or greater to indicate the presence of multicollinearity. Based on prior research, we tested interactions between deployment status and health care provider occupation (Dew et al., 2004; Fullerton et al., 2004), and also between sex and health care occupation status (Wells et al., 2010). A p value of $< .05$ was used to indicate a significant interaction. None of the tests for multiplicative interaction were statistically significant (sex by health care occupation status, $p = .25$; combat by health care occupation status, $p = .43$), so analyses proceeded without stratification.

The main model for this study examined the odds of a newly identified positive screen for PTSD or depression among combat deployers only, comparing health care professionals with personnel in all other occupations. To be included, subjects had to have completed a combat deployment prior to at least one follow-up assessment. If a relationship exists between health care provider status and new-onset PTSD or depression among combat deployers, our sample size of 8,579 for this model was sufficient for detecting an odds ratio of 1.3 or greater with 80% power; however, we would not have the power to detect an odds ratio of less than 1.3 for this analysis. The secondary model for this study assessed the odds for incident PTSD or depression among deployed health care professionals only. To be included in this model, subjects had to report a health care occupation on all questionnaires. Subanalyses for the main and secondary models were conducted by removing health care professionals in administrative jobs to see if results were consistent. All regression models were adjusted for the amount of time between baseline and follow-up assessments, and demographic, military, and behavioral variables. Data management and statistical analyses were performed using SAS software, Version 9.2 (SAS Institute, Inc., Cary, North Carolina).

Results

Univariate analyses revealed that all Table 1 variables were significantly associated with occupation status except for trouble sleeping and history of panic or anxiety disorder. Compared with personnel in other occupations, health care professionals were more likely to be female, born before 1960, other than white non-Hispanic race/ethnicity, more educated, in the Army, and in the Reserve/Guard. Health care professionals were also more likely to be never married or divorced; nonsmokers; report a prior trauma or assault; report fewer problems with alcohol; and not be deployed, either before baseline or to the recent operations (Table 1).

The incidence of positive screens for PTSD or depression is reported in Table 2 for the first and second follow-up assessments. The overall incidence of positive screens was 4.6% at the first follow-up and 4.0% at the second follow-up. Of participants who completed both the first and second follow-up ($n =$ 34,194), 497 subjects (1.4%) who newly-reported the PSTD or depression at the first follow-up had this outcome persist over the second follow-up. The incidence was similar among those in all health care occupations compared with other occupations (first follow-up, $p = .667$, second follow-up, $p = .276$). When examining specific health care categories, the medical care or support category, comprised of 98% enlisted personnel, had the highest incidence of PTSD or depression at both follow-ups, while the group of physicians, nurses, and psychologists comprised only of officers had the lowest. Incidence among those who deployed and reported combat was much greater at both time points (8.7% and 7.3%) compared with those who

Table 1
Characteristics by Status as Health Care Professionals

Characteristics	Other occupation		Health care professional		χ^2
	n	%	*n*	%	
Non-time-varying characteristics					
Sex					3098.7***
Male	42,018	75.4	4,431	47.3	
Female	13,719	24.6	4,940	52.7	
Birth year					101.6***
Pre-1960	10,564	19.0	2,154	23.0	
1960–1969	19,537	35.1	2,938	31.4	
1970–1979	17,887	32.1	3,040	32.4	
1980–beyond	7,749	13.9	1,239	13.2	
Race/ethnicity					46.4***
White, non-Hispanic	40,036	71.8	6,422	68.5	
Black, non-Hispanic	6,511	11.7	1,169	12.5	
Other	9,190	16.5	1,780	19.0	
Education					876.0***
Some college or less	41,291	74.1	5,551	59.2	
Bachelor's degree or higher	14,446	25.9	3,820	40.8	
Service branch					64.6***
Army	26,606	47.7	4,885	52.1	
Navy/Coast Guard	10,852	19.5	1,729	18.5	
Air Force	18,279	32.8	2,757	29.4	
Service component					117.8***
Reserve/Guard	24,465	43.9	4,678	49.9	
Active duty	31,272	56.1	4,693	50.1	
Military pay grade					1141.7***
Enlisted	43,255	77.6	5,747	61.3	
Officer	12,482	22.4	3,624	38.7	
Time-varying characteristics[a]					
Marital status					71.2***
Never married	18,333	32.9	3,265	34.8	
Married	34,060	61.1	5,372	57.3	
Divorced/widowed/separated	3,344	6.0	734	7.8	
Smoking status					241.3***
Nonsmoker	32,275	57.9	6,100	65.1	
Past smoker	13,657	24.5	2,173	23.2	
Current smoker	9,805	17.6	1,098	11.7	
Trouble sleeping					2.1
No trouble sleeping	44,462	79.8	7,415	79.1	
Trouble sleeping	11,275	20.2	1,956	20.9	
Prior assault or trauma					184.7***
No prior assault	49,475	88.8	7,857	83.8	
Prior assault	6,262	11.2	1,514	16.2	
Alcohol-related problems					52.3***
No alcohol-related problems	50,227	90.1	8,667	92.5	
At least one alcohol-related problem	5,510	9.9	704	7.5	
History of panic or anxiety					0.0
No history of panic/anxiety	55,200	99.0	9,279	99.0	
History of panic/anxiety	537	1.0	92	1.0	

(*Continued*)

Table 1
Continued

Characteristics	Other occupation		Health care professional		
	n	%	*n*	%	χ^2
Deployment specific					
Deployed prior to baseline					1135.2***
No deployment before baseline	33,025	59.3	7,264	77.5	
Deployment before baseline to recent operations	5,367	9.6	520	5.5	
Deployment before baseline to another operation	17,345	31.1	1,587	16.9	
Recent deployment experience					1000.5***
Nondeployed	34,210	61.4	6,920	73.8	
Deployed without combat at least once	10,389	18.6	533	5.7	
Deployed with combat at least once	11,138	20.0	1,918	20.5	
Cumulative deployment length (months)					540.7***
Nondeployed	34,210	61.4	6,920	73.8	
Deployed <6	7,891	14.2	956	10.2	
Deployed 6–9	4,341	7.8	496	5.3	
Deployed >9	9,295	16.7	999	10.7	
Cumulative number of deployments					596.5***
Nondeployed	34,210	61.4	6,920	73.8	
1 deployment	14,813	26.6	1,872	20.0	
2 deployments	4,470	8.0	447	4.8	
More than 2 deployments	2,244	4.0	132	1.4	

Note. The sample of individuals in other occupations was $N = 55{,}737$ and the sample of health care professionals was $N = 9{,}371$.

[a]These characteristics report the baseline status, but were allowed to vary with time in the models.
***$p < .001$.

Table 2
Incidence of a New Positive Screen for PTSD or Depression From 2001—2008

Characteristics	PTSD or depression							
	First follow-up[a]				Second follow-up[b]			
	Incident cases	Subjects at risk	%	χ^2	Incident cases	Subjects at risk	%	χ^2
Overall frequency	2,710	58,551	4.6		1,352	34,194	4.0	
Occupational status				0.2				1.2
All health care professionals	336	7,105	4.7		168	3,932	4.3	
Other occupations	2,374	51,446	4.6		1,184	30,262	3.9	
Type of health care profession								
Medical care/support	161	2,503	6.4	Ref	75	1,151	6.5	Ref
Physician, nurse, psychologist	54	1,823	3.0	25.6***	32	1,164	2.7	17.6***
Biomed, allied health, dentist	42	1,148	3.7	11.2***	19	631	3.0	9.5**
Medical admin or health services	79	1,631	4.8	4.5*	42	986	4.3	5.2*
Deployment experience								
None	1,884	43,411	4.3	Ref	1,017	27,143	3.7	Ref
No combat	204	7,707	2.7	46.9***	71	3,454	1.0	24.8***
Combat	622	7,433	8.7	212.0***	264	3,597	7.3	98.8***

Note. PTSD = posttraumatic stress disorder. The study sample from the first follow-up was $N = 58{,}551$ and the study sample from the second follow-up was $N = 34{,}194$.

[a]The first follow-up period for the first and second panels enrolled in the Millennium Cohort Study. [b]The second follow-up period includes members of the first panel of the Millennium Cohort Study because data for the second follow-up of the second panel has not yet been collected.
* $p < .05$. ** $p < .01$. *** $p < .001$.

Table 3
Adjusted Odds Ratios of a New Positive Screen for PTSD or Depression Among Combat Deployers, N = 8,579

	PTSD or depression	
Characteristics	AOR[a]	95% CI
Health care provider		
No	1.00	
Yes	0.85	[0.66, 1.10]
Cumulative months deployed		
<6	1.00	
6–9	1.05	[0.84, 1.32]
>9	1.07	[0.88, 1.31]
Number of deployments		
1	1.00	
2	0.69	[0.55, 0.86]
>2	0.66	[0.47, 0.92]

Note. Number of combat deployers who screened positive for PTSD or depression was $N = 766$, or 8.9% of total sample of combat deployers. PTSD = posttraumatic stress disorder; AOR = adjusted odds ratio; CI = confidence interval.

[a]The generalized linear model using generalized estimating equations included only those participants with at least one combat deployment prior to assessment of the outcome at each follow-up. The model includes all variables shown in the table and was adjusted for the following covariates: marital status, smoking status, trouble sleeping, prior assault or trauma, alcohol-related problems, history of panic or anxiety symptoms, sex, birth year, race/ethnicity, education, service branch, service component, military pay grade, and deployment experience prior to baseline to Southwest Asia, Bosnia, or Kosovo from 1998–2000.

Table 4
Adjusted Odds Ratios of a New Positive Screen for PTSD or Depression Among Deployed Health Care Professionals, N = 1,492

	PTSD or depression	
Characteristics	AOR[a]	95% CI
Deployment experience		
No combat exposure	1.00	
Combat exposure	2.01	[1.06, 3.83]
Cumulative months deployed		
Deployed <6	1.00	
Deployed 6–9	0.83	[0.44, 1.58]
Deployed >9	1.38	[0.79, 2.43]
Number of deployments		
1 deployment	1.00	
2 deployments	0.37	[0.17, 0.83]
More than 2 deployments	1.27	[0.53, 3.07]

Note. Number of deployed health care professionals who screened positive for PTSD or depression was $N = 97$, or 6.5% of total sample of deployed health care professionals. PTSD = posttraumatic stress disorder; AOR = adjusted odds ratio; CI = confidence interval.

[a]The generalized linear model using generalized estimating equations included only participants who reported being a health care professional at each assessment and who deployed prior to each outcome assessment. The model included all variables shown in the table and was adjusted for marital status, smoking status, trouble sleeping, prior assault or trauma, alcohol-related problems, history of panic or anxiety symptoms, sex, birth year, race/ethnicity, education, service branch, service component, military pay grade, and deployment experience prior to baseline to Southwest Asia, Bosnia, or Kosovo from 1998–2000.

deployed without combat (2.7% and 1.0%, $p < .001$) or did not deploy (4.3% and 3.7%, $p < .001$; Table 2).

In the main analysis restricted to deployers who reported combat experience, having a health care occupation did not contribute to the odds of new-onset PTSD or depression, after adjustment (Table 3). Combat deployers who deployed two times or more were at significantly lower odds of screening positive for PTSD or depression. Results from the subanalysis for this model that excluded health care professionals in administrative positions found consistent results, with no significant association observed between health care occupation and screening positive for the outcome (data not shown).

The secondary analysis restricted to deployed health care professionals showed that after adjustment, those reporting combat experience had twofold higher odds for incident PTSD or depression compared with health care professionals who did not report combat experience (odds ratio [*OR*] = 2.01; 95% confidence interval [CI], [1.06, 3.83]; Table 4). Health care professionals with two deployments during the follow-up period were at significantly lower odds for developing the outcome, while those with more than two deployments had higher odds, though very few cases occurred in this group. A subanalysis excluding health care professionals in administrative jobs was unsuccessful due to model nonconvergence because of small numbers.

Discussion

Medical professionals are a unique subset of the deploying population who may be less likely to be involved in direct combat but who are on the front lines of treatment of the trauma and mental health disorders stemming from combat. A recent review article concluded that military health care professionals exposed to trauma were at increased risk for mental health outcomes compared with those not exposed to trauma (Gibbons, Hickling, & Watts, 2012), which was also shown in this study. Although these professionals do screen positive for PTSD or depression following deployment, these findings suggest that these individuals are not at higher risk compared with professionals in other occupations. This study used longitudinal analyses to examine the incidence of screening positive for PTSD or depression over an average follow-up period of 4.75 years. Findings highlighted that the reporting of combat experience, rather than being in a health care occupation, was significantly associated with risk of PTSD or depression because health care professionals exposed to combat were at increased risk for these outcomes similar to non-health care professionals, as shown in previous work (T. C. Smith, Ryan et al., 2008; Wells et al., 2010).

There are several possible reasons why no association was observed between health care occupation and a newly reported positive screen for PTSD or depression. One reason may be the way in which combat experience was defined and how it may vary between health care professionals and other occupations. Combat experience in this study did not include any direct measures of actually being in combat, but rather combat-related events, such as witnessing a person's death due to war, disaster, or tragic event. Another reason may be that a higher proportion of military officers were in health care occupations compared with other occupations, and officers tend to report fewer mental disorders than enlisted personnel (T. C. Smith, Ryan et al., 2008; Wells et al., 2010). In addition, combining all health care professionals may have masked an association present in smaller subgroups, as we reported that personnel in medical care or support roles had a higher prevalence of the outcome than other types of health care occupations (Table 2). This specific group may warrant further follow-up research with a larger sample of these individuals than was available for this study.

Health care professionals tend to utilize the health care system (Jacobson et al., 2008; Wells et al., 2008), therefore we hypothesized that these individuals would be at higher risk for the outcome due to more opportunity for detection. The risk for PTSD or depression, however, may not be greater in this population due to increased access to care and the potential greater understanding of treatment or prevention for these disorders. Also, health care professionals may recognize a screening instrument and choose not to report, which may bias this study toward not finding an association.

The relationship between number of deployments and risk of screening positive for PTSD or depression among combat deployers implied lower risk with more than one deployment. The reasons for this association are more likely due to selection factors than deployment, as military personnel who were healthier and more resilient may have been more likely to deploy more than once or volunteer to deploy multiple times. Those who deploy only once may not have deployed again due to health reasons or injury, which we did not measure in this study. The inconsistent pattern seen between number of deployments and risk of PTSD or depression among health care professionals is likely due to the lack of power to detect an association, since there were only three deployed health care professionals with more than two deployments who experienced the outcome.

This study has several limitations. First, the definition of combat experience used in this study included reports of witnessing traumatic events rather than personal experience of these events, which may have attenuated our results. The Millennium Cohort is composed of a sample of the military population that self-reports exposures and symptoms. Multiple investigations of possible reporting and selection biases in baseline Millennium Cohort data, however, suggest reliable reporting of data, minimal response bias, and a representative sample of military personnel, including deployers (B. Smith, Smith, Gray, & Ryan, 2007; T. C. Smith, Smith, Jacobson, Corbeil, & Ryan, 2007; Wells et al., 2008). Specifically, self-reported occupation was found to agree well with occupation records maintained in electronic military data (T. C. Smith, I. G. Jacobson et al., 2007). Although the use of standardized instruments for self-reported data as surrogates for clinical diagnoses of PTSD and depression may be imperfect, both the PCL-C and the PHQ are internally valid in Millennium Cohort members (T. C. Smith, B. Smith et al., 2007), and they have shown strong reliability and validity in other populations (Kroenke et al., 2001; Ruggiero, Del Ben, Scotti, & Rabalais, 2003). The potential for misclassification bias was also present because subjects may have misreported their occupation, or electronic occupation codes may have been incorrect. It is expected that this misclassification, however, did not occur differentially with respect to the outcomes studied. Also, the number of subjects in each of the subcategories of health care professionals and in some deployment locations was too small to investigate these subgroups in multivariable models. An additional limitation was the inability to adjust for unit social support. Finally, when segmenting the population into combat deployers or deployed health care professionals, numbers were insufficient to investigate PTSD and depression separately. An additional analysis, however, was conducted to examine these outcomes separately using the entire study population and adjusting for combat deployment, and results remained consistent (data not shown).

This study also has important strengths. It is the first to our knowledge to use prospective data to identify incident PTSD or depression symptoms among military health care professionals exposed to combat during deployment in support of the operations in Iraq and Afghanistan. In addition, using validated instruments to screen for PTSD and depression may better identify individuals with subclinical disease. To ensure we were not restricting the variance of our outcomes by using a dichotomous measure, we ran additional analyses using continuous scores for PTSD and depression (models run separately) and found our results to be consistent. We also confirmed our results a posteriori by examining the mental component summary score (MCS) from the medical outcomes study SF-36 health survey for veterans (Ware & Kosinski, 2001), where we found statistically similar adjusted mean MCS scores of 47.5 for health care professionals and 47.3 for other occupations among combat deployers. The Millennium Cohort also has the advantage of being systematically drawn from all branches and both components of the armed forces. Also, while this study focused on deployed service members, the risk for PTSD or depression in a population including nondeployed personnel was also examined, but still found no association between health care occupation status and development of the outcome (data not shown).

These results do not support an increase in likelihood of PTSD or depression among health care professionals deployed to the recent operations compared with other occupations. Combat experience appeared again as the key determinant of development of these outcomes. Other features of health care professional responsibilities, such as caring for wounded military personnel, by inference do not appear related to higher odds of

these outcomes. This study's findings may help military leadership further understand that the problem of mitigation of PTSD and depression among health care professionals appears to be the same as for other professionals deployed to military operational theaters, and should continue to focus resources on coping with the effects of combat experiences.

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14. ABSTRACT

We examined the longitudinal association between newly reported posttraumatic stress disorder (PTSD) or depression among health care professionals following deployment in support of the operations in Iraq and Afghanistan. Longitudinal analyses were conducted using generalized estimating equations to estimate the odds of screening positive for PTSD or depression, adjusting for fixed and time-varying demographic, military, and behavioral covariates. A newly identified positive screen for PTSD or depression was assessed using the PTSD Checklist-Civilian Version and the Patient Health Questionnaire, respectively. Of the 65,108 study participants, 9371 (14.4%) reported working as health care professionals for at least one assessment. The incidence rates of screening positive for PTSD or depression were similar for those in health care occupations (4.7% and 4.2%) compared with those in other occupations (4.6% and 3.9%) for the first and second follow-up, respectively. In the multivariate model, among military personnel deployed with combat experience, health care professionals did not have an increased risk for PTSD or depression over time. Among deployed health care professionals, combat exposure significantly increased the risk (adjusted odds ratio [AOR] = 2.01, 95% confidence interval [CI], 1.06-3.83) and having two deployments was protective (AOR = 0.37, 95% CI, 0.17-0.83) for PTSD or depression.

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